WHAT IS CLAIMED IS:

1. A helmet position measuring system for use in a predefined environment, the system comprising:

(a) a helmet-mounted illumination system for directing electromagnetic radiation of at least one wavelength from the helmet in at least one range of angles;

(b) a set of at least three passive reflectors deployed at fixed positions in the predefined environment so as to reflect electromagnetic radiation from said illumination system;

(c) a helmet-mounted imaging system sensitive to at least said at least one wavelength for deriving images of part of the predefined environment including electromagnetic radiation reflected from said reflectors; and

(d) a processing system associated with said imaging system for processing said images to identify regions of said images corresponding to said reflectors and hence to determine information relating to a position of the helmet within the predefined environment.

2. The helmet position measuring system of claim 1, wherein said illumination system includes at least one infrared LED.

3. The helmet position measuring system of claim 1, wherein said imaging system is at least partially selective to electromagnetic radiation of at least one wavelength.

4. The helmet position measuring system of claim 1, wherein said illumination system directs said electromagnetic radiation substantially continuously within a horizontal angular range of at least 60°.

5. The helmet position measuring system of claim 1, wherein said illumination system directs said electromagnetic radiation substantially continuously within a vertical angular range of at least 40°.

6. The helmet position measuring system of claim 1, wherein at least part of said processing system is located in a housing external to, and electrically interconnected with, the helmet, said housing being configured for wearing on the body of a user.

7. The helmet position measuring system of claim 1, further comprising an inertial measurement system associated with the helmet and connected to said processing system for providing additional information relating to a position of the helmet.

8. The helmet position measuring system of claim 7, wherein said inertial measurement system includes three angular motion sensors deployed in fixed relation to the helmet so as to sense rotational motion about three orthogonal axes.

9. The helmet position measuring system of claim 8, wherein the helmet has a convexly curved external surface, and wherein said three angular motion sensors are mounted in proximity to substantially mutually orthogonal regions of said curved external surface.

10. The helmet position measuring system of claim 8, wherein the helmet has a convexly curved external surface, the system further comprising a cover element attached to the helmet, said cover element having a concave surface facing said convexly curved external surface of the helmet, wherein said three angular motion sensors are mounted relative to said cover element at substantially mutually orthogonal regions of said concave surface.

11. The helmet position measuring system of claim 7, wherein the predefined environment is part of a moving platform, the moving platform having at least one associated platform position measurement system, the helmet position measuring system further comprising a communications link associated with said processing system and with at least one element on the moving platform, said communication link transferring platform position information derived from said at least one platform position measurement system to said processing system, and wherein said processing system is configured to compute inertially-derived relative motion information relating to motion of the helmet within the predefined environment by comparing said information from said inertial measurement system with said platform position information.

12. The helmet position measuring system of claim 11, wherein said processing system is configured to employ an adaptive filter calculation to combine said inertially-derived relative motion information and said position information derived from said images to generate overall helmet position information.

13. The helmet position measuring system of claim 11, wherein said communications link is implemented as a wireless communications link.

14. The helmet position measuring system of claim 13, wherein said communications link is associated with at least one of the group: a processing unit within a missile; and a processing unit within a missile launcher.

15. The helmet position measuring system of claim 1, further comprising a helmet-mounted eye-tracking system for tracking a gaze direction of at least one eye relative to the helmet.

16. The helmet position measuring system of claim 15, wherein said eye-tracking system is associated with said processing system, said processing system calculating a gaze direction of the at least one eye relative to the predefined environment.

17. A helmet position measuring system for determining the position of a helmet relative to a moving platform, the moving platform having an inertial navigation system, the system comprising:

(a) an inertial measurement system associated with the helmet;

(b) a communication link associated with both the helmet and the platform, said communication link transferring data from the inertial navigation system to the helmet; and

(c) a processing system associated with said inertial measurement system and said communication link, said processing system processing data from said inertial measurement system and said data from the inertial navigation system to derive inertially-derived helmet position data indicative of the helmet position relative to the moving platform.

18. The helmet position measuring system of claim 17, wherein said processing system is configured to perform transfer alignment of the inertial measurement system from the inertial navigation system of the platform.

19. The helmet position measuring system of claim 17, wherein said inertial measurement system includes three angular motion sensors deployed in fixed relation to the helmet so as to sense rotational motion about three orthogonal axes.

20. The helmet position measuring system of claim 19, wherein the helmet has a convexly curved external surface, and wherein said three angular motion sensors are mounted in proximity to substantially mutually orthogonal regions of said curved external surface.

21. The helmet position measuring system of claim 19 wherein the helmet has a convexly curved external surface, the system further comprising a cover element attached to the helmet, said cover element having a concave surface facing said convexly curved external surface of the helmet, wherein said three angular motion sensors are mounted relative to said cover element at substantially mutually orthogonal regions of said concave surface.

22. The helmet position measuring system of claim 17, further comprising an optical measuring system associated with said processing system, said optical measuring system including:

(a) at least three markers mounted on a first of the helmet and the moving platform;

(b) at least one camera mounted on the other of the helmet and the moving platform for generating an image of at least said markers; and

(c) image processing means for processing said image to generate optically-derived helmet position data,

wherein said processing system is additionally for co-processing said inertially-derived helmet position data and said optically-derived helmet position data to generate overall helmet position information.

23. The helmet position measuring system of claim 22, wherein said camera is mounted on the helmet, and wherein said at least three markers are mounted on the moving platform.

24. The helmet position measuring system of claim 23, wherein said optical measuring system includes at least one illumination source mounted on the helmet, and wherein said at least three markers are passive reflective markers.

25. The helmet position measuring system of claim 17, further comprising a helmet-mounted eye-tracking system for tracking a gaze direction of at least one eye relative to the helmet.

26. The helmet position measuring system of claim 25, wherein said eye-tracking system is associated with said processing system, said processing system calculating a gaze direction of the at least one eye relative to the moving platform.

27. A helmet assembly having a position measuring system, the helmet assembly comprising:

(a) a helmet having a convexly curved external surface; and

(b) an inertial measurement system including three angular motion sensors deployed in fixed relation to the helmet so as to sense rotational motion about three orthogonal axes, wherein said three angular motion sensors are mounted in proximity to substantially mutually orthogonal regions of said curved external surface.

28. A helmet assembly having a position measuring system, the helmet assembly comprising:

(a) a helmet having a convexly curved external surface;

(b) a cover element attached to the helmet, said cover element having a concave surface facing said convexly curved external surface of the helmet; and

(c) an inertial measurement system including three angular motion sensors for sensing rotational motion about three orthogonal axes, wherein said three angular motion sensors are mounted relative to said cover element at substantially mutually orthogonal regions of said concave surface.

29. A method for reliable real-time calculation of pupil gaze direction over a wide range of angles, the method comprising:

(a) illuminating an eye with electromagnetic radiation of at least one wavelength;

(b) obtaining an image of the illuminated eye;

(c) identifying within said image a pupil location;

(d) automatically determining whether said image includes a direct corneal reflection;

(e) if said image does not include a direct corneal reflection, calculating a current pupil gaze direction based upon said pupil location, said calculating being performed using a pupil-only gaze direction model;

(f) if said image does include a direct corneal reflection, deriving a current pupil gaze direction based upon both said pupil location and a position of said direct corneal reflection.

30. The method of claim 29, further comprising updating at least one parameter of said pupil-only model based upon at least one pupil gaze direction derived from both said pupil location and said position of direct corneal reflection.